CLAIMS

What is claimed is:

1. A catadioptric projection lens for projecting a pattern located on an object plane onto an image plane, wherein, between the object plane and the image plane, the following are arranged in the given order:

a first objective part, which creates a ray;

a physical beam splitter with a beam splitter surface, whereby the ray created by the first objective part is directed to the physical beam splitter;

a mirror group with a refractive power of the mirror group and a concave mirror; and

a second objective part with positive refractive power, which creates an image of the pattern on the image plane, wherein the refractive power of the mirror group is high and the system aperture is located imagewise behind the concave mirror.

2. A projection lens according to claim 1, wherein the system aperture is located between the beam splitter surface and the image plane.

3. A projection lens according to claim 2, wherein the system aperture is located close to or on a rear exit surface of the beam splitter.

4. A projection lens according to claim 1, wherein the refractive power of the mirror group is calculated such that a divergent beam incident on the mirror group is transformed into a convergent beam.

5. A projection lens according to claim 1, wherein the refractive power of the mirror group is calculated such that the sum of the absolute values of the peripheral ray angles of beams incident on the mirror group and of beams exiting from the mirror group are much larger than zero.

6. A projection lens according to claim 1, wherein the first objective part is designed for creating a divergent beam directed to the beam splitter.

7. A projection lens according to claim 1, wherein the first objective part is designed such that an exiting divergent beam has a minimum peripheral ray angle of more than 20% of the image side numerical aperture of the projection lens.

8. A projection lens according to claim 1, wherein the first objective part in front of the beam splitter has a negative refractive power adapted to create a waist section in the ray trajectory.

9. A projection lens according to claim 1, wherein the refractive power of the mirror group is calculated such that the ray on the image side behind the mirror group is convergent.

10. A projection lens according to claim 1, wherein the beam exiting on the image side of the mirror group has a peripheral ray angle of more than 10% of the image side numerical aperture.

11. A projection lens according to claim 1, wherein the absolute value of the peripheral ray angle of the rays arriving at the mirror group is larger than the absolute value of the peripheral ray angle of the rays emitted from the mirror group.

12. A projection lens according to claim 1, wherein no free-standing lens is placed between the beam splitter surface and the concave mirror.

13. A projection lens according to claim 1, wherein the concave mirror has a positive magnification.

14. A projection lens according to claim 1, wherein the first objective part contains a deviating mirror, a first lens group between the object plane and the deviating mirror, and a second lens group between the deviating mirror and the beam splitter.

15. A projection lens according to claim 1, wherein the second objective part is constructed in the manner of a retro focus objective, with at least one lens with negative refractive power between the beam splitter and the rear lenses with a total positive refractive power.

16. A projection lens according to claim 1, wherein the beam splitter surface is arranged in a beam splitter serving as a supporting body and the system aperture is positioned outside of the beam splitter.

17. A projection lens according to claim 1, wherein the beam splitter surface is positioned in a beam splitter block that has an optical minimal shape other than cubic shape, and wherein the maximum radiated material volume is more than 70% of the outer volume of the beam splitter block.

18. A projection lens according to claim 1, wherein the beam splitter surface is a polarizing beam splitter surface and a quarter wave plate is positioned between the beam splitter surface and the concave mirror.

19. A projection lens according to claim 1, wherein all transparent optical components are made of the same material.

20. A projection lens according to claim 1, wherein the second objective part contains no correction means with a first lens material and a second lens material of different dispersion for correcting chromatic correction.

21. A projection lens according to claim 1, wherein the image side numerical aperture is more than approx. 0.7.

22. A projection lens according to claim 1, wherein the projection lens is constructed such that the pattern is projected onto the image plane without creating an intermediate image.

23. A projection lens according to claim 1, wherein the sine of the maximum beam angle at a refracting or reflecting surface for all surface, with the exception of a maximum of three most imagewise surfaces, is less than 80% or 70% of the image side numerical aperture.

24. A projection lens according to claim 1, comprising at least one optical component with at least one aspherical surface.

25. A projection lens according to claim 1, wherein at least one aspherical surface is positioned in the area of the system aperture and at least one aspherical surface is positioned in the area of at least one of the object plane and the image plane.

26. A method for manufacturing semiconductor devices and other microdevices with the following steps:

providing a mask with a given pattern;

illuminating the mask with ultraviolet light of a given wavelength; and

projecting an image of the pattern on a photosensitive substrate located in the area of the image plane of the projection lens with the help of a catadioptric projection lens comprising, between the object plane and the image plane and in the given order:

a first objective part, which creates a ray;

a physical beam splitter with a beam splitter surface and to which the ray is directed;

a mirror group with a refractive power of the mirror group and a concave mirror; and

a second objective part with positive refractive power, which creates an image of the pattern on the image plane, wherein the refractive power of the mirror group is high and the system aperture is located imagewise behind the concave mirror.